

# First Test of Fan Active Noise Control (ANC) Completed

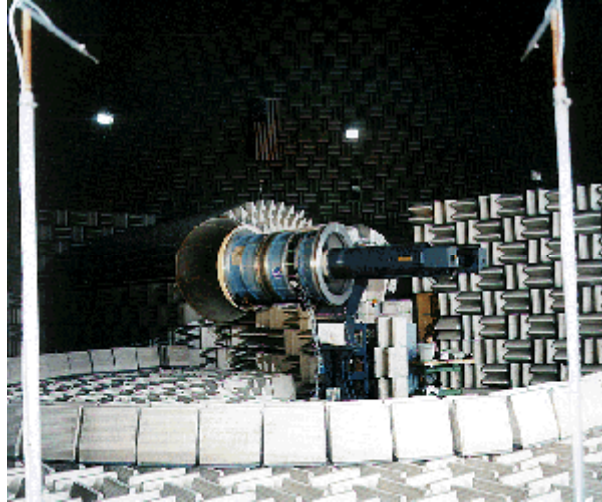
With the advent of ultrahigh-bypass engines, the space available for passive acoustic treatment is becoming more limited, whereas noise regulations are becoming more stringent. Active noise control (ANC) holds promise as a solution to this problem. It uses secondary (added) noise sources to reduce or eliminate the offending noise radiation.

The first active noise control test on the low-speed fan test bed was a General Electric Company system designed to control either the exhaust or inlet fan tone. This system consists of a "ring source," an induct array of error microphones, and a control computer. Fan tone noise propagates in a duct in the form of spinning waves. These waves are detected by the microphone array, and the computer identifies their spinning structure. The computer then controls the "ring source" to generate waves that have the same spinning structure and amplitude, but 180° out of phase with the fan noise. This computer-generated tone cancels the fan tone before it radiates from the duct and is heard in the far field.

The "ring source" used in these tests is a cylindrical array of 16 flat-plate acoustic radiators that are driven by thin piezoceramic sheets bonded to their back surfaces. The resulting source can produce spinning waves up to mode 7 at levels high enough to cancel the fan tone. The control software is flexible enough to work on spinning mode orders from -6 to 6. In this test, the fan was configured to produce a tone of order 6.

The complete modal (spinning and radial) structure of the tones was measured with two builtin sets of rotating microphone rakes. These rakes provide a measurement of the system performance independent from the control system error microphones. In addition, the far-field noise was measured with a semicircular array of 28 microphones.

This test represents the first in a series of tests that demonstrate different active noise control concepts, each on a progressively more complicated modal structure. The tests are in preparation for a demonstration on a flight-type engine.



*General Electric Company's active noise control system installed on the 4-ft low-speed fan in Lewis' Aero-Acoustic Propulsion Laboratory.*